Diaprepes abbreviatus (Coleoptera: Curculionidae): Oil Sprays as a Regulatory Treatment, Effect on Egg Attachment[1]

W. J. SCHROEDER AND D. S. GREEN[2]

U.S. Horticultural Research Laboratory, Agricultural Research Service, U.S. Department of Agriculture, Orlando, Florida 32803

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ABSTRACT When Florida citrus spray oil (FC 435-66) or Volck spray oil was applied to *Dracaena marginata* foliage, the bond between *Diaprepes abbreviatus* (L.) eggs and the leaf surface was affected. The total *D. abbreviatus* eggs remaining on plants 1 week posttreatment were 160 for FC 435-66 at 10 ml of oil per liter of water and 17,120 on check plants. There were 359 and 0 eggs on plants treated with Volck oil at 3.9 and 7.8 ml of oil per liter of water, respectively, compared to 3,391 eggs on check plants. Oil sprays had no significant effect on oviposition or weevil egg hatch. FC 435-66 or Volck spray oil at 10 and 7.8 ml/liter of water had no effect on the commercial quality of *D. marginata* plants produced in Florida with cuttings from plants treated in Puerto Rico. The use of an oil spray in combination with wind, sun, and rain mechanically reduced the number of *D. abbreviatus* eggs on *D. marginata* plants.

Diaprepes abbreviatus (L.), a sugarcane rootstalk borer, is an important pest of sugarcane, citrus, and other agricultural crops in the West Indies. The weevil was first reported in central Florida in 1964 (Woodruff 1964). By 1982 it had infested 4,000 ha of citrus in central Florida and was found in several nurseries in south Florida. State and federal agencies have attempted to limit weevil spread through population suppression and by regulatory treatments applied to infested citrus and ornamental nurseries. The presence of *D. abbreviatus* life stages in a nursery results in quarantine restrictions. Because of the restrictions, *D. abbreviatus* represents a potential economic threat to the tropical and subtropical ornamental and the citrus nursery industries.

The adult weevil feeds on foliage, and the eggs (ca. 100 per mass) are deposited between leaves that the female cements together. Larvae feed on roots, causing damage that often leads to host decline. When Florida citrus spray oil FC 435-66 (Simanton and Trammell 1966) was applied to citrus, most eggs deposited after spray became detached from the foliage and were no longer a source of weevil reproduction (Schroeder et al. 1977).

Dracaena marginata Lam. cuttings from Puerto Rico are exported to nurseries in the United States, where they are grown as foliage plants. Leaves of *D. marginata* are frequently used as oviposition sites by *D. abbreviatus*. Infested cuttings are destroyed and represent an economic loss to the exporting nursery. Undetected eggs also represent a possible source of weevil introductions to uninfested areas in the United States. The following study was conducted with *D. marginata* in both Puerto Rico and Florida, to determine the phytotoxicity of spray oils to *D. marginata* and their effect on weevil oviposition and egg attachment. The results are reported here.

Materials and Methods

Plant Growth

D. marginata plants growing in full sun at Dorado, Puerto Rico, were sprayed in July with FC 435-66 spray oil at 0, 10, 20, and 30 ml/liter of water. Five hundred cuttings per treatment, taken 1 week after being sprayed, were shipped to a commercial nursery in Apopka, Fla. Cuttings were planted in 12-cm pots containing a 60% peat-40% bark soil medium. In October, plants were evaluated for market quality by the nursery manager.

The test was repeated in August at Dorado, Puerto Rico. Cuttings, 500 per treatment, were shipped to a second nursery in Apopka, Fla., and rooted in a bed of 60% peat-40% bark soil mix on benches. Evaluation of plant quality was made by the nursery manager in January.

A third group of plants was sprayed in March with Volck spray oil (available in Puerto Rico) at 0, 3.8, and 7.8 ml of oil/liter of water. Cuttings, 100 per treatment, were shipped from Dorado 1 week after being sprayed and planted in 12-cm pots containing a 60% bark-40% peat soil mix at the U.S. Department of Agriculture Root Weevil Laboratory in Plymouth, Fla. Growth measurements on a 20 plant sample for each treatment were made in April and May. All plants were evaluated for quality in June. Data were analyzed by analysis of variance (ANOVA).

Weevil Oviposition

To determine if oil had an affect on oviposition by female *D. abbreviatus*, *D. marginata* plants were sprayed in Florida to runoff with FC 435-66 and Volck spray oil at 10 and 7.8 ml/liter of water, respectively. There were 10 plants per treatment. Controls were sprayed with water. Ten leaves per treatment were removed from plants on days 1, 2, 3, and 4 or 5 posttreatment and placed in a cage with adult weevils for 24 hours. Leaf sections (5

[1]This paper reports the results of research only. Mention of a pesticide does not constitute a recommendation for use by the U.S. Department of Agriculture, nor does it imply registration under FIFRA, as amended. Also, mention of a commercial or proprietary product does not constitute endorsement by the U.S. Department of Agriculture. Received for publication 28 February 1983; accepted 12 August 1983.

[2]Present address: April Agro Industries, Box 818, Santa Isabel, PR 00757.

Table 1. Mean height and market quality of *D. marginata* plants grown in Florida from cuttings treated in Puerto Rico with Volck oil spray, Plymouth, Fla., 1982

Treatment (ml of oil/liter of water)	Mean height (cm ± SE)[a]		No. of plants/100 of marked quality: June
	April	May	
0.0	38.2 ± 1.6	40.7 ± 2.0	100
3.9	37.9 ± 1.0	40.5 ± 2.1	100
7.8	37.5 ± 1.3	40.5 ± 2.0	100

[a]Means in a column are not significantly different, by ANOVA ($P > 0.05$).

cm) upon which females oviposited were maintained in individual, 50-ml vials at high moisture for egg hatch. This prevented desiccation of eggs that became exposed or detached from treated leaves. Total number of eggs per leaf by treatment and percentage of hatch were determined by counting neonate larvae and unhatched eggs. Data were analyzed by comparing eggs on treated and control leaves in a Student's *t* test.

Egg Attachment

Test 1.—In July, 20 *D. marginata* plants in Florida were sprayed to runoff with 0 and 10 ml of FC 435-66 spray oil per liter of water, 10 plants per treatment. The plants were maintained outside in full sun to approximate growing conditions in Puerto Rico. Adult weevils were caged on the plants for 24 h at 1 week posttreatment. Plants upon which females had oviposited were maintained in full sun for 1 week, and the number of eggs was determined.

Test 2.—Fifteen *D. marginata* plants were sprayed to runoff with 0, 3.9, and 7.8 ml of Volck spray oil per liter of water, five plants per treatment. The testing procedures were the same as used in test 1.

Results and Discussion

Plant Growth

Plants produced by the commercial nurseries in Florida from cuttings sprayed with FC 435-66 spray oil at 30 ml/liter of water were of poor quality. Plants from cuttings sprayed in Puerto Rico with 0, 10, and 20 ml of oil per liter of water were of market quality. The high rates of 20 and 30 ml of oil per liter of water were used only to determine the threshold for phytotoxicity. Because of the poor color of the plants from cuttings treated with 30 ml of oil per liter, this rate was phytotoxic. Results are given in Table 1 for the third group of cuttings that was treated with Volck oil and planted at the U.S. Department of Agriculture Laboratory. There was no significant difference ($P > 0.05$) in plant height, color, or quality in April or May. There were no detectable differences in plant color or quality in June and all plants were of market quality.

Weevil Oviposition

When leaves of *D. marginata* were treated with FC 435-66 or Volck spray oil at 10 and 7.8 ml of oil per liter of water, respectively, and compared with a control sprayed with water, there was no significant difference ($P > 0.05$) in weevil oviposition or egg hatch. There were 10,640 eggs on leaves sprayed with FC 435-66, compared with 10,310 eggs on control leaves and 16,760 eggs on leaves treated with Volck spray oil compared with 16,780 on controls sprayed with water. Egg hatch was >80% for both treated and untreated leaves, when eggs were maintained in 50-ml vials at high moisture.

Egg Attachment

Test 1.—The total number of eggs recovered from plants maintained in full sun and sprayed with FC 435-66 oil at 10 ml/liter of water was 160, compared to 17,120 eggs from plants that received no oil spray.

Test 2.—There were 359 and 0 *D. abbreviatus* eggs on plants treated with Volck oil spray at 3.9 and 7.8 ml of oil per liter of water, respectively. 3,391 eggs were found on five *D. marginata* plants treated with water as a check.

Oil deposits had no effect on number of eggs deposited or on hatchability if sections of leaves containing newly deposited egg masses were placed in vials and maintained at high moisture. Egg masses removed from their leaf envelope but not maintained at high moisture desiccate and perish. The number of eggs recovered from treated plants 1 week posttreatment compared with untreated plants was significantly reduced. FC 435-66 and Volck spray oils affect the bond between eggs and the leaf surface, thus allowing wind, sun, and rain to mechanically remove the eggs.

The use of an oil spray at 10 ml FC 435-66 per 1 liter of water or 7.8 ml of Volck spray oil per 1 liter of water 1 week before cuttings are taken, provides a procedure to reduce the potential for movement of *D. abbreviatus* eggs on *D. marginata* cuttings. The 1-week period allows time for eggs deposited before treatment to hatch and larvae to disperse to other hosts. Most of the eggs laid on treated foliage would become detached before cuttings are taken or during the cutting and handling procedures. This method to reduce *D. abbreviatus* eggs on *D. marginata* cuttings could possibly be applied to other insect and plant species.

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Evaluation of Internal Elen
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D. W. BURNS,[3] M. P. MURPHY,[2] K. L.

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ABSTRACT Ten elements (Co.
inductively coupled plasma-atomic
trometry (FAES) for their ability to
on tagged and control artificial di
prepared for ICP-AES and FAES
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Adverse effects were observed in
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The sterile-male technique for controllin
ulations was originally suggested by Kni
To date, several means have been propose
crimination of mass-reared insects from n
including dyes, pigments, radioisotopes,
markers (Lindquist 1969). The present me
ing mass-reared Mediterranean fruit fly (
atitis capitata (Wiedemann), with a fluore
for sterile-male release programs is acc
eclosion (Holbrook et al. 1970). The fluor
is green under ultraviolet (UV) radiation
visual discrimination of mass-reared med
tive medflies. After the infestation in 198
Santa Clara County, Calif., two problem
fied that concerned the reliability of th
marking mass-reared medfly (D. S. Jac
communication). First, when a large nun
captured in a single field trap, the fluo
might be transmitted to native medflies.
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has been investigated (Moss and Van
Recent research (Burns et al. 1983)
the marking of PBW reared on arti

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Mention of proprietary products does not neces
by the USDA.

[2]Present address: Dow Chemical Co., P.
CA 94565.
[3]Dept. of Chemistry, Arizona State Unive
[4]Person to whom all correspondence sho
[5]U.S. Department of Agriculture—Anin
spection Service—Plant Protection and Quara
Phoenix, AZ 85040.
[6]Present address: Methods Development
tion, USDA, APHIS-PPQ, P.O. Box 2280 H